

# Maggots, mutilations and myth: Patterns of postmortem scavenging of the bovine carcass

P. Nick Nation, Elisabeth S. Williams

## Abstract

Based upon what is known about the habits of common carrion eaters in Alberta, we review the patterns of postmortem scavenging of carcasses of cattle. We then compare with these patterns those reported in the lay press and by veterinarians investigating cattle mutilations in Alberta. We conclude that the so-called "mutilation" of cattle in Alberta was due to scavenging of carcasses and further conclude that claims of human involvement in such incidents require, as a first condition, that postmortem scavenging of the carcass be excluded.

## Résumé

### Modèles de nécrophagie des carcasses de bovins : mutilations ou mythes

Une revue des modèles de nécrophagie des carcasses de bovins fut effectuée en utilisant les données des habitudes connues des nécrophages communs en Alberta. Une comparaison fut faite entre ces modèles et ceux rapportés par la presse et par des vétérinaires qui ont eu à enquêter sur des cas de mutilation de bovins en Alberta. La conclusion qui a résulté de cette comparaison indique qu'il ne s'agissait pas de mutilation mais bien de nécrophagie. En plus, il serait nécessaire d'éliminer la nécrophagie avant de considérer une implication humaine dans de tels incidents.

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## Introduction

Some ten years ago, the news media in Alberta reported unusual findings in dead cattle. Various structures, usually either genital organs or portions of the face and head, were missing in animals found dead on range (1,2). Characteristically, tissue edges surrounding the removed areas were described as being remarkably smooth (2). This phenomenon was the subject of newspaper and magazine articles, television interviews, and at least one half-hour television program.

Ranchers who were normally rational and critical, and otherwise analytical members of the media, were given to wild speculation about the possible origins of these findings. The phenomenon was attributed in the popular press to visitors from outer space (2-5), satanic cults (3,6), deranged persons (1), and/or the military or CIA (2,3).

Animal Health Division, Alberta Agriculture, O.S. Longman Building, 6909-116 Street, P.O. Box 8070, Edmonton, Alberta T6H 4P2 (Nation); Wyoming State Veterinary Laboratory, Department of Veterinary Services, University of Wyoming, 1190 Jackson Street, Laramie, Wyoming 82070 (Williams).

It became obvious that there was virtually no information available about the patterns of scavenging of cattle carcasses on range in western North America. It also became apparent that many experienced cattlemen who had seen dead animals in the past, had not paid much attention to the details of scavenging. The cattle "mutilation" phenomenon drew attention to this lack of observation. In some cases, suspicion of foul play developed in the minds of ranchers and this often interfered with examination of the circumstances under which the animal died. Often the owner would not accept that an animal had died of disease and had been scavenged. In several situations, people observed a carcass with pieces missing and, assuming that it was maliciously done, did not look for evidence of scavengers in the area. Often neighbors would gather, trample the local environment, and destroy evidence that might have existed. In many such cases, no post-mortem examination was performed and consequently a definite cause of death was not established.

Many veterinary practitioners attributed the phenomenon to scavenging following death by natural causes. Although this view is widely held in the veterinary profession, it has never been documented in the veterinary press. Our purpose in this review is to summarize what is known about the scavenging of bovine carcasses, to provide a brief overview of the distribution of defects that occurred in cattle in Alberta, and to present evidence that the "mutilation" observed was the work of scavengers.

## Predation

An important distinction is that between a scavenger and a predator. A scavenger is "an animal that feeds on decaying matter" (7) (Figure 1), which in this review means an animal that feeds on a bovine carcass. A predator is "an animal that preys on other animals" (7) (Figure 2). In the rangeland of western North America, many predators are also scavengers (8) depending upon season and circumstances.

Distinguishing scavenging from predation is reasonably easy if the carcass is discovered prior to or shortly after feeding has commenced; it becomes more difficult as consumption progresses. Both the environment and the carcass should be examined to establish predation. In the environment there may be signs of a struggle which may include disturbed turf and broken bushes. There will usually be blood either in the area or at some point removed from the carcass. Hair or pieces of hide may be present on fences, or the carcass may have barbed wire cuts on the skin. During wintertime, footprints of predators may be observed in the snow. There may be blood on the hindlimbs of the animal if it has been "hamstrung" or brought down from behind. Pooling of blood on



**Figure 1.** An example of scavenging: perineal region of a cow, dead on range, scavenged by coyotes. Photograph has been rotated 90 degrees to give a more natural orientation.

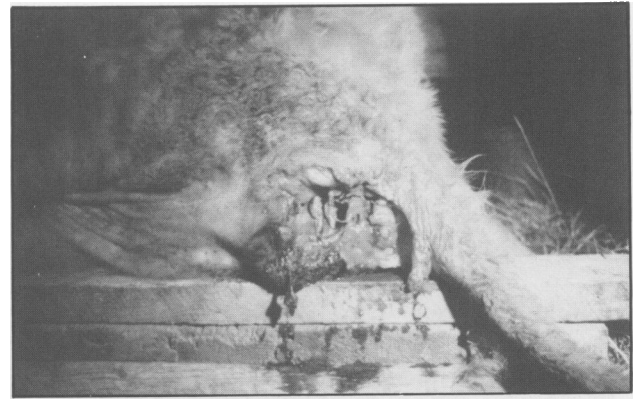
the ground immediately around the carcass is not necessarily a sign of predation as this may occur after death if there are skin defects due to scavenging. On the other hand, blood some distance from the carcass is an indicator of predation.

Examination of the carcass should include skinning the throat and the hindlimbs and examining for bite wounds. Subcutaneous hemorrhage and tearing of muscles are invariably present. Canine teeth produce small punctures in the skin but extensive damage in the underlying tissue. There will often be holes in the trachea if the predator kills by grabbing the neck. The head and neck region is most commonly attacked by predators (8) but is often the last part of the carcass consumed. Thus antemortem hemorrhage, bite wounds, and trauma in the head and neck areas often can be found after extensive consumption of the carcass.

Further discussion of predation is well covered in references 8-11.

### Postmortem changes

When an animal dies, decomposition begins immediately. Circulation stops, wounds in the skin may ooze or drip but no longer actively bleed, and blood gravitates to the dependent parts. In cattle, the temperature of the body rises immediately following death as rumen fermentation continues and enzymes release their energy. This is particularly true during the



**Figure 2.** An example of predation: perineal region of a calving cow eaten by pigs. The cow is in right lateral recumbency on the bed of a truck.

summer and fall. Bacteria, particularly *Clostridia* spp. from the gastrointestinal tract, rapidly invade the carcass and putrefaction begins. This process releases considerable gas, and, in combination with postmortem gas-driven expansion of the rumen, causes the carcass to bloat. Bloating and putrefaction cause protrusion of the tongue, eyes, rectum, anus and vulva. Subcutaneous and abdominal gas causes swelling of the scrotum and increased prominence of the prepuce. Viscera protrude from any defects in the abdominal wall.

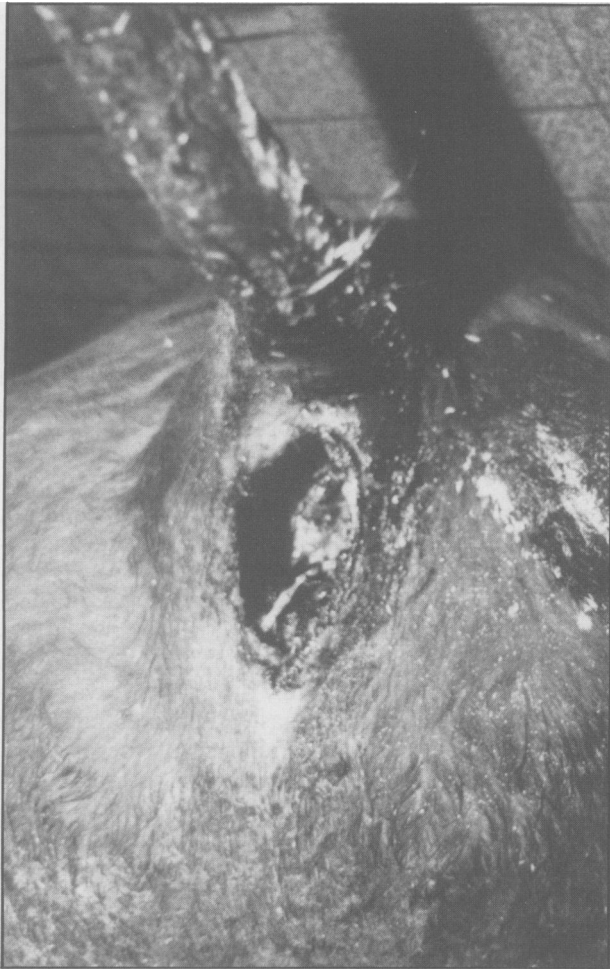
The skin stretches as bloating develops. Consequently, the edges of any defects in the skin become taut and straighten, and the defects become circular or ovoid. As decomposition progresses, and parts are removed by scavengers, gas production decreases, bloating subsides and the carcass dehydrates. At this point, remnants of protruding structures retract into the carcass. If structures have been removed by scavengers, the cavity produced is accentuated, making it appear that removal has occurred from deep within the cavity (3).

### Scavenging

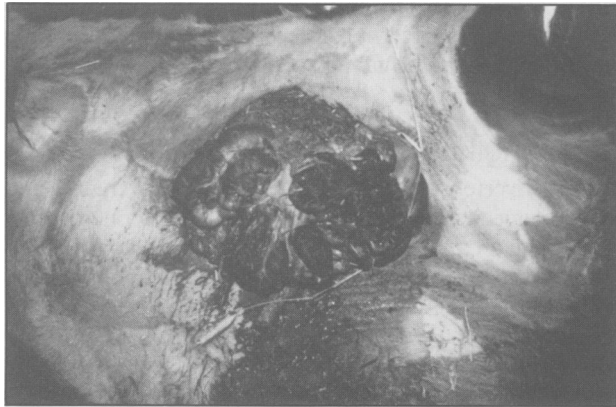
Many invertebrates and vertebrates are scavengers, and several species may either consecutively or concurrently scavenge a carcass (8). Undisturbed, scavenging continues until all soft tissues have been eaten, leaving only the bones. If scavengers are disturbed, the carcass will remain intact except for the parts removed prior to disturbance. Consequently, if only the soft protruding parts had been removed when disturbance occurred, the carcass may present a bizarre appearance as scavengers will leave with only the early part of their feeding pattern complete, i.e. facial structures, anus, other body openings (see below). They may never complete scavenging the carcass.

Scavenger species include wolves, coyotes, dogs, skunks, badgers, foxes, pigs, weasels, bears, bobcats, other mammalian species, and various birds including magpies, ravens, crows, gulls and raptors. Cougars tend not to feed on carrion other than their own kills (8).

We found virtually no information in the scientific literature on the patterns of scavenging of carcasses in the wild. There are a few reports of scavenging by invertebrate animals, mostly insects. Therefore, any



**Figure 3.** Anus of a bull scavenged by coyotes.



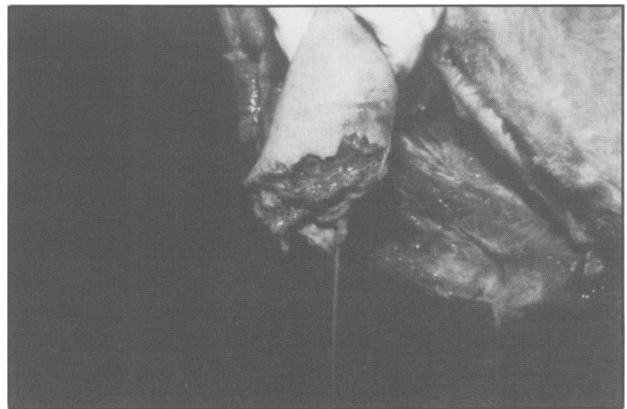
**Figure 4.** Scrotum of a bull scavenged by coyotes. Animal is in dorsal recumbency, viewed from above, prepuce on left edge of photograph.

discussion of scavenging must be based upon the patterns of consumption of prey by those species which are both predators and scavengers. Since a species is not likely to change its eating patterns depending upon whether prey or carrion is consumed, this approach is justified. The following is an attempt to summarize what is known of the feeding patterns of each species. While each species has a general pattern of feeding, individuals can vary from the norm.

*Coyotes* readily consume carrion and may be the main mammalian scavenger in the rangelands of



**Figure 5.** Carcass scavenged by coyotes. Coyotes approach the viscera through the flank where the skin and muscle are thinnest.



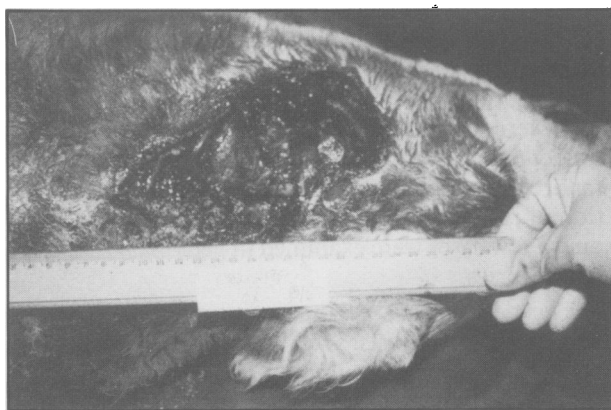
**Figure 6.** Penis of a bull scavenged by coyotes. Note irregular edge of defect

western North America. Their consumption of carrion is less in summer (12,13) than in winter, when carrion composes about 65% of their food (12). As a yearly average, 36-38% of the diet of coyotes is carrion (12,13), which is mostly agricultural carrion. Coyotes feed first on the soft parts of the carcass, including the nose, tongue, anus (Figure 3), scrotum (Figure 4), and mammary gland, then the internal organs, liver, intestine and heart, and last the muscles. They will enter the carcass where the tissue is softest or the muscles and skin thinnest, namely the flank immediately anterior to the hind leg (14,15) (Figure 5), ventral abdomen, and perineum. As a result, they consume the tissues in those areas first: anus, vulva, mammary gland, prepuce, penis (Figure 6), and scrotum. Coyotes will eat the mammary gland prior to entering the abdominal cavity (9). Once the abdominal wall is opened, the viscera will be partly pulled out (Figure 7) and eaten, and the uppermost thigh is usually partly consumed. Coyotes tend to leave the bones of a carcass intact (10), although they may occasionally chew and spread bones around. They like to chew on rubber and therefore like ear-tags. The exposed ear is often torn off (Figure 8), whereas that against the ground is usually intact.

A characteristic of coyote feeding is the careful and clean manner in which the hide of a carcass is peeled from the meat, leaving a white patch of subcutaneous tissue (9,12) (Figure 7). The skin is left virtually intact



**Figure 7.** Closeup of Figure 5, same orientation. Caudal abdomen of a bovine scavenged by coyotes. The abdomen has been opened and the intestines pulled out. Note the apparently smooth skin edges and the relatively intact abdominal musculature, a feature of coyote scavenging.

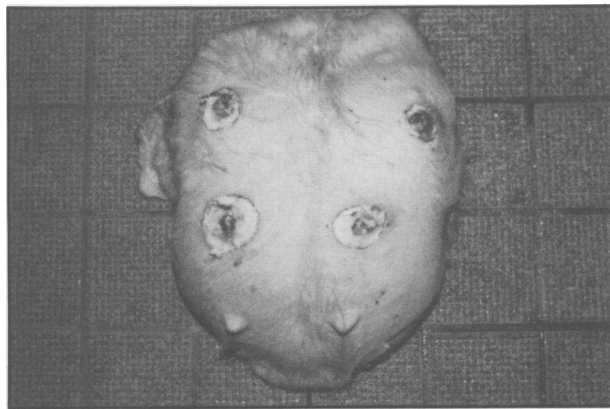


**Figure 8.** Calf with uppermost ear torn off by coyotes. The other ear was intact. Photograph of animal in dorsal recumbency has been turned to give more natural orientation. Animal's muzzle is under prosector's hand, poll region of the head protrudes above ruler.

and there is very little tearing or shredding. Similarly, there is a very neat appearance to the skin wound produced by coyotes during their feeding (12). In contrast, they leave ragged edges on the underlying muscle and tendons (8). Coyotes pull off mouthfuls of food without bracing their feet against the carcass (11). Coyotes feed more carefully on a carcass than do wolves and domestic dogs, with less tearing, ripping and waste (12), although some authors claim that coyotes scatter the remains of their prey widely (11).

*Wolves* begin feeding on a bovine carcass at the hindquarters. They commence in the region of the tail and anus (10), feeding preferentially on viscera and hind legs (9). Wolves will not necessarily consume a carcass at one time but will return repeatedly until it is completely eaten. The bites of wolves are very clean, with the cut being "as that of a scythe on maturing hay" (16). Wolves chew and break bones (9) and characteristically scatter bones from ungulate kills (17).

*Dogs* may not be important scavengers of bovine carcasses in Alberta as they usually have an alternate source of food. Whereas there are true feral dogs outside North America, within North America a dog is "feral" while roaming on someone else's property (12) and becomes "domestic" as soon as it crosses to its



**Figure 9.** Mammary gland of a lactating cow. Teats have been removed by a scavenger. Ventral view of mammary gland removed from carcass.

owner's property. Therefore, the distinction between feral and domestic dogs is blurred, and for the purposes of this discussion they can be considered to be the same. Dogs can be predators, hunting and killing prey, but often chase and kill for fun, tending not to feed on prey (8,9,10). Some dogs kill efficiently, and tend to feed like coyotes (8). More often dogs will not kill, but leave injured prey to die from shock, loss of blood, or infection (8). In contrast to coyotes, dogs show little or no preference in their order of feeding. They rip and tear the hide, chew the bones (10) pull out entrails, and scatter wool.

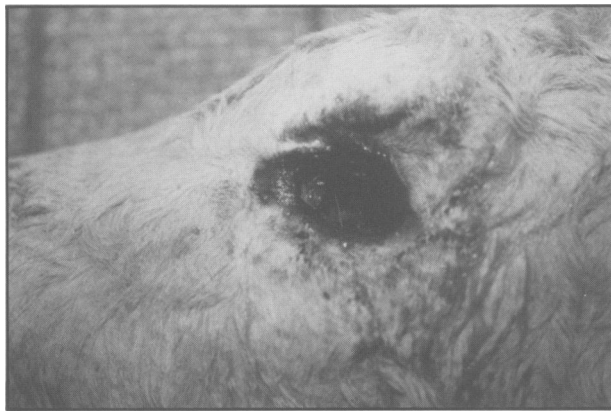
The *red fox* is indigenous to Alberta. These animals feed on the side of a carcass nearest the ground, usually starting from the perineum (11). They often remove the lips, udders or genitals, making "surprisingly straight and knife-like cuts" (11).

*Skunks* also scavenge carcasses, tending to first chew on soft parts such as the ear, nose and tongue. Some Alberta pest control officers have observed that a particular characteristic of skunk scavenging is removal of the teats from the udder (Figure 9), but this is unsubstantiated in the literature.

*Weasels* will enter a carcass through the anus or other available openings and eat various internal organs, leaving minimal external disturbance (3). *Raccoons* are rare in Alberta. They feed in two patterns. One is from the perineum of a carcass (11). More commonly, they make a small hole (3 cm) just behind the ribs and pull the viscera out, cleaning the carcass out neatly with their hand-like paws (11).

*Black bears* and *grizzly bears* feed similarly, but black bears feed more readily on carrion than do grizzly bears. Bears characteristically eat the mammary gland (11), especially of lactating animals (8,15). They feed on the flesh of a limb through a hole in the upper thigh, leaving the skin and bones more or less intact. There is conflicting evidence regarding the order in which bears eat a carcass. Roy and Dorrance (9) claim that bears prefer meat to the viscera. These authors and O'Gara (11) state that bears eat the hindlimbs first. On the other hand, Griffel and Basile (15) claim that the abdomen is entered via the udder or flank and the viscera eaten before the musculature, leaving the hindquarters for last (15). Bears tend to remove the skin of sheep intact (15).





**Figure 10.** Upper eye of calf removed by a bird; the other eye was intact.

*Bobcats* and *mountain lions* generally eat from the shoulder first. Bobcats clean off bones but crush or break only small bones. Cougars live almost exclusively on prey they have killed, and only occasionally scavenge (18); they often eat through a small round hole in the abdominal cavity (18), leaving clean-cut edges when they feed (9).

*Avian scavengers* include *ravens* and *maggies* which will peck out the upper eye of a dead animal (Figure 10). The eye closest to the ground is almost always intact (3). These birds also attack the anal and vulvar regions (9). Carrion-eating birds pull muscles from tendons, leaving frilly white tufts on the bones (11). Droppings can often be found on top of the carcass when there has been scavenging by birds.

*Eagles* cut meat and tendons cleanly (11) and also attack the orbital, anal and vulvar areas of the carcass. The long beaks of eagles allow them to clean out the entire orbital socket of a carcass without causing any significant disturbance of the eyelids. They feed on viscera, hollowing out carcasses, leaving the skin and bones intact (11). When eagles have scavenged a carcass, there is often down in the vicinity. Eagles will consume the bones of young animals. They feed on the upper side of the thorax of a carcass, picking the intercostal muscles clean.

With the trend to total confinement, scavenging by *pigs* is much less common than in the past though pigs should not be overlooked as scavengers. Pigs tend to start feeding at the anal and perineal regions.

Straight edges are often reported along defects produced by predators or scavengers (16), however, close examination of the edges of such defects usually reveals one or more characteristics. While the edges may have oozed or dripped blood, there will not be evidence of active arterial bleeding. The edges may be smooth in places, but areas of roughness or irregularity can be found (Figure 11). Hairs crossing the edges of the skin defect may be intact or irregularly broken by the teeth of the scavenger. There may be tooth marks along the edges of the skin defect, particularly scratches caused by canine teeth.

## Mutilation

To mutilate is "to cut, tear, or break off a part of; injure seriously by cutting, tearing or breaking off some part" (7).



**Figure 11.** Closeup view of the edge of a skin defect revealing irregularities produced by a scavenger.

In Alberta between 1978 and 1980, the news media reported that cattle were being found dead with various parts missing; these were referred to as "cattle mutilations". This term came into widespread use with the implication that the death and removal of parts occurred under suspicious circumstances. These findings were attributed to pervers, cults, and aliens in unidentified flying objects (1). Many mutilations were reported but were never formally brought to the attention of police or other authorities. Of those that were, only a few cases were examined in veterinary diagnostic laboratories.

The descriptions of missing parts were strikingly similar. Two reports are representative of those in which cattle were not subjected to laboratory examination (1,19). In one, seven animals were reported as missing "sex organs, tongues, lips, or even tails" (19). In the other, the animals in question were missing the "lower lip, tongue, an ear and a straight-edged rectangle of hide from the udder to the hind legs" (1).

Those animals that were presented to veterinary laboratories as "cattle mutilations" had a pattern of parts missing that was similar to those listed in the news media. In those animals submitted before extensive autolysis occurred, a diagnosis was usually established as the following examples show.

**Case 1:** A four-year-old bull with the tongue, right ear, prepuce, scrotum, testes, and perianal area missing. The edges of the skin, tongue and rectum were ragged. The cause of death was established as interstitial pneumonia.

**Case 2:** A five-year-old cow was found dead on pasture and was missing the rostral part of the tongue, the teats, perianal skin, vulva and underlying muscle. Close examination of the wounds revealed ragged edges and canine teeth marks around all missing parts. Postmortem examination revealed interstitial pneumonia as the cause of death.

**Case 3:** A one-month-old beef calf was found dead, missing the left eye. The eyelids were intact. The skin from the navel to the perineum was missing. There was a ragged tear in the nictitating membrane of the missing eye. The caudal lateral abdominal musculature was open with the intestines and cecum protruding. Postmortem examination revealed a necrotizing abomasitis as the cause of death.

**Case 4:** An older cow was found dead on pasture, extremely autolyzed, with the mammary gland missing. There was an opening in the skin around the anus and vulva. There were irregular jagged defects in the skin around the anus and vulva at the mucocutaneous junction similar to those produced by scavengers. The skin of the right inguinal region and three teats were missing. A chewed stump remained in place of each teat. Canine teeth marks were found along the edges of the skin defects. The vagina and part of the uterus were torn out with a jagged stump remaining. Tearing and bite marks were present in the rumen wall. There were bird droppings on the skin and a heavy infestation by maggots of all exposed tissues. The animal was too autolyzed to determine the cause of death.

In all four of the examples above, the owner suspected that the animal had been mutilated. We concluded that all four had been scavenged.

## Conclusions

It can be seen from the previously mentioned newspaper accounts and case reports that the parts reported missing from mutilated cattle are the same as those known to be removed by scavengers, primarily coyotes and birds, in the early stages of scavenging a carcass. Jagged edges and tooth marks were found in all laboratory-examined animals. Therefore, we propose that in the absence of any evidence to the contrary:

1. dead cattle are mutilated in Alberta (according to the dictionary definition given above);
2. the mutilations are the work of scavenger animals, mainly coyotes and birds;
3. the mutilations occur after the animal has died; and
4. any investigation of bizarre gross findings in dead cattle must rule out scavenging beyond any reasonable doubt before proceeding to investigation of other possibilities.

These conclusions are not original. Rather, they have been arrived at by a number of investigators, and, although mentioned in the lay press (2,3,5,19), they have never been documented in the veterinary literature. They are hereby entered to this literature as a reference for those who are called upon to investigate cattle deaths and "mutilations".

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